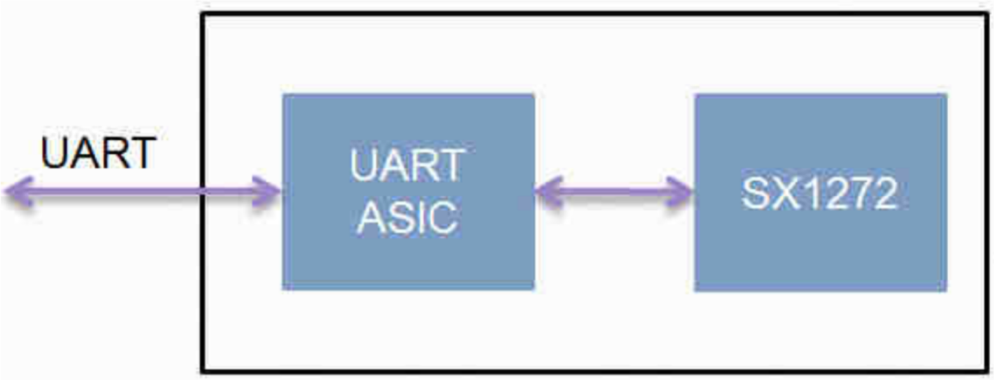
LoRa iL-LoRa1272 Apps Notes

Description

iL-LoRa1272 transceiver module is development by Semtech SX1272 solution, for the detail IC specification please visit Semtech website as below to download data sheet www.semtech.com

The Application note has described and explain How to using LoRa module

Block Diagram



iFroglab LoRa module has integration two chip on Module board. One is ASIC MCU that control SX1272 thru SPI interface and get AT command from UART transport.

Therefore, we have provided a AT command table as below link.

http://www.ifroglab.com/download/UARTCmd_SocLoraV5.pdf

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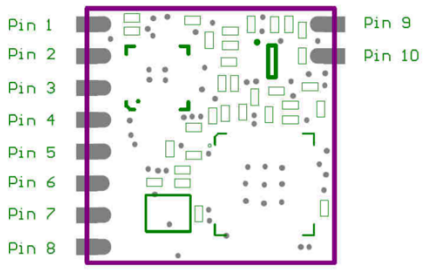
LoRa AT command:

If you have successful to download and will see such table as below.

2017.06.13 Ver : 0.5	Headr Code	SX1272 0xC1	SX1276 0xC2		115200	8,n,1										
	BYTE-1	BYTE-2	BYTE-3	BYTE-4	BYTE-5	BYTE-6	BYTE-7	BYTE-8	BYTE-9	BYTE-10	BYTE-11	... ...	... ...	BYTE-35	BYTE-36	
	Headr Code	Command	len	Data-1	Data-2	Data-3	Data-4	Data-5	Data-6	Data-7	Data-8	... ...	... ...			
讀取F/W版本及Chip ID																
PC -> MCU	0x80	0x00	0x00	CRC												SW Version。
PC <- MCU	0x80	0x80	0x06	Chip	FW_Ver	MID[4]				CRC						Chip：Sx1272(0xC1)、Sx1276(0xC2)、FW_Version：0x06。
重置 & 初始化																
PC -> MCU	0xC1 0xC2	0x01	0x00	CRC												Reset (Lora Mode Default)。
PC <- MCU	0xC1 0xC2	0xAA	0x01	0x55	CRC											MCU收到資料回ACK。
讀取設定狀態																
PC -> MCU	0xC1 0xC2	0x02	0x00	CRC												RF Chip 設定值。
PC <- MCU	0xC1 0xC2	0x82	0x08	Mode	Freq[3] 注1			Power 注2	BW	CR	SF	CRC				Mode：Sleep(0x00)、StandBy(0x01)、Tx(0x02)、Rx(0x03)、Default StandBy。 BW:125k(0x01)、250k(0x2)、500k(0x3)、Default 500K。 CR:4/5(0x1)、4/6(0x2)、4/7(0x3)、4/8(0x4)、Default 4/5。 SF:6(0x1)、7(0x2)、8(0x3)、9(0x4)、10(0x5)、11(0x6)、12(0x7)、Default 9。
設定模式與頻率																

We will guide you and step by step to explain this table

First step, try to identify LoRa module and check your connection is correct or NOT.



Pin Name	Pin Type	Description
Pin 1	GND	
Pin 2	Host_IRQ	For RX mode Data ready → high level No data → low level (Note 1)
Pin 3	VDD	
Pin 4	EICK	NC (Note 2)
Pin 5	EIDA	NC (Note 2)
Pin 6	GND	
Pin 7	UART_TX	UTX: UART transmit output pin
Pin 8	UART_RX	URX: UART receive input pin
Pin 9	Antenna	External antenna connected pad
Pin 10	GND	

Note 1: Host_IRQ is always high level when RX data ready & it will change to low after Host read data.

Note 2: For F/W ISP (In System Program) & please reserve test pad.

Please notes:

The LoRa module TX pin needs connection to target board UART RX pin

And The LoRa TX pin connection to target board UART TX pin.

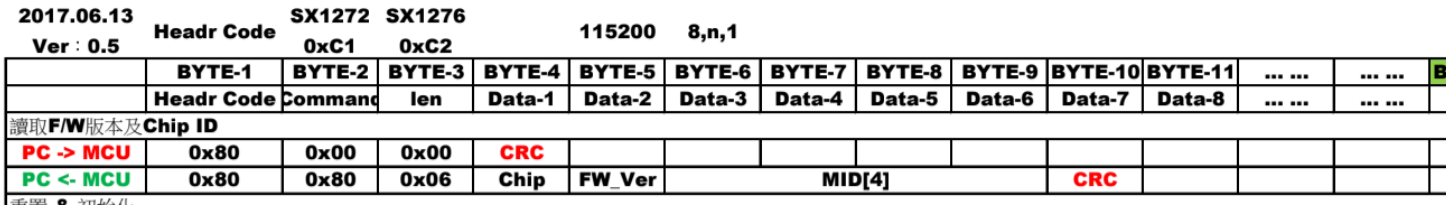
For Example:

Pin name	Arduino Uno	LoRa
VCC	3.3V	Pin3 (VCC)
GND	GND	Pin1(Gnd)
IRQ	Pin9	Pin2(IRQ)
UART	Pin10	Pin7(UART TX)
UART	Pin11	Pin8(UART RX)

When finish your connection thru wire and confirm it.

We should confirm thru Command of **get Chip**.

Get CHIP ID.



2017.06.13 Ver：0.5	Headr Code	SX1272 0xC1	SX1276 0xC2		115200	8,n,1							
	BYTE-1	BYTE-2	BYTE-3	BYTE-4	BYTE-5	BYTE-6	BYTE-7	BYTE-8	BYTE-9	BYTE-10	BYTE-11	... ...	... ...
	Headr Code	Command	len	Data-1	Data-2	Data-3	Data-4	Data-5	Data-6	Data-7	Data-8	... ...	... ...
讀取F/W版本及Chip ID													
PC -> MCU	0x80	0x00	0x00	CRC									
PC <- MCU	0x80	0x80	0x06	Chip	FW_Ver	MID[4]				CRC			

Please follow this comment as above.

1. Manually Mode:

   PC-> MCU meaning, Arduino to LoRa module

   Arduino sent these command sequence as:

   0x80 0x00 0x00 CRC.

   The **LoRa module** will response to Arduino

   0x80 0x80 0x06 0xC1 FW_Ver MID0 MID 1 MID2 MID3 CRC.

2. Arduino program and get CHIP ID.

   We Could see this code on Github.

   https://github.com/iFrogLab/IL-LORA1272/blob/master/Samples-Arduino/Ver2/iFrogLabLoRaLibrary/sample01_chipInfo/sample01_chipInfo.ino

The Arduino program as same as Manually mode.

```
byte* iFrogLabLoRaLibrary::GetChipIDAll()

{

  byte CRC = 0;

  byte t1[] = {0x80,0,0,CRC};

  CRC=Fun_CRC(t1,3);

  t1[3] = CRC;


  mySerial->write(t1, 4);

  Fun_PrintArray(t1,4);

 ……..

……

…
```

Setup Frequency and channel.

PC -> MCU	0xC1 0xC2	0x02	0x00	CRC											
PC <- MCU	0xC1 0xC2	0x82	0x08	Mode	Freq[3] 注1			Power 注2	BW	CR	SF	CRC			

RF Chip 設定值。
Mode : Sleep(0x00)、StandBy(0x01)、Tx(0x02)、Rx(0x03)。Default StandBy。 BW:125k(0x01)、250k(0x2)、500k(0x3)。Default 500K。 CR:4/5(0x1)、4/6(0x2)、4/7(0x3)、4/8(0x4)。Default 4/5。 SF:6(0x1)、7(0x2)、8(0x3)、9(0x4)、10(0x5)、11(0x6)、12(0x7)。Default 9。

When we successful get CHIP ID. Congratulation the wire and connection is Correctly.

Then we can move next step. Setup frequency and channel and TX/RX mode.

1. Manually Mode:

   PC-> MCU meaning, Arduino to LoRa module

   Arduino sent these command sequence as:

0xC1	0x82	0x08	Mode	Freq 2	Freq 1	Freq 0	Power	BW	CR	SF	CRC

- Freq2/Frep1/Frep0

  For example, if you want to setup 915.00MHz.

  please Switch **Hexadecimal** of 91500 then fill into 0x1656C -> 0x01 0x65 0x6C

  The SX1272supported range (860.00 ~ 1020.00MHz), so you could change any Frequency as you want.

- Power

  SX1272 SOC Lv0(2dBm) ~ Lv15(17dBm)。

- Mode

  Mode : Sleep(0x00)、StandBy(0x01)、Tx(0x02)、Rx(0x03)。Default StandBy。

- BW

  BW:125k(0x01)、250k(0x2)、500k(0x3)。Default 500K。

- C/R

  CR:4/5(0x1)、4/6(0x2)、4/7(0x3)、4/8(0x4)。Default 4/5。

- SF

  SF:6(0x1)、7(0x2)、8(0x3)、9(0x4)、10(0x5)、11(0x6)、12(0x7)。Default 9。

Setup working mode(TX/RX) and frequency channel.

設定模式與頻率

PC -> MCU	0xC1 0xC2	0x03	0x05	Mode	Freq[3] 注1			Power 注2	CRC						
PC <- MCU	0xC1 0xC2	0xAA	0x01	0x55	CRC										

if we done the previous setting as BW/CR/SF that you have successful to setting basic functional parameter for LoRa.

Now, we could need to know How to switch TX mode or RX mode.

The Command has provided a quite setting that could switch these TX mode or RX mode.

For example,

Manually Mode:

PC-> MCU meaning, Arduino to LoRa module

Arduino sent these command sequence as:

0xC1	0x03	0x05	Mode	Freq2	Freq1	Freq0	Power	CRC

- Freq2/Frep1/Frep0

  For example, if you want to setup 915.00MHz.

  please Switch **Hexadecimal** of 91500 then fill into 0x1656C -> 0x01 0x65 0x6C

The SX1272supported range (860.00 ~ 1020.00MHz), so you could change any Frequency as you want.

- Power

  SX1272 SOC Lv0(2dBm) ~ Lv15(17dBm)。

- Mode

  Mode : Sleep(0x00)、StandBy(0x01)、Tx(0x02)、Rx(0x03)。Default StandBy。

Write Data to LoRa

PC -> MCU	0xC1 0xC2	0x05	0x01 ~ 0x20	Data0	Data1	Data2	Data3	Data4	Data5	... ...	Data30	Data31	CRC
PC <- MCU	0xC1 0xC2	0xAA	0x01	0x55	CRC								

When you done as pervious setting for TX mode then you could be sent MCU data thru such command to lower layer queue.

The Lower layer will automatic to sent this data thru LoRa,you don't need to consider manage these register of LoRa.

Manually Mode:

PC-> MCU meaning, Arduino to LoRa module

Arduino sent these command sequence as:

0xC1	0x05	0x01-0x20	Data0	Data1	Data2	……	Data31	CRC

✧ 0x01-0x20 –> Payload size.

The Arduino program as same as Manually mode.

```
Void iFrogLabLoRaLibrary::Write16bytesBroadcast(byte iData[],byte len){

  WriteMode();

  byte t2[16+1+3];

  byte CRC = 0;

  // byte len=sizeof(iData) / sizeof(byte);  // sizeof(iData); //(byte)(iStr.length());

  //byte len1=len+1;

  if(len==0) return;
```

Read data from LoRa queue

PC -> MCU	0xC1 0xC2	0x06	0x00	CRC											
PC <- MCU	0xC1 0xC2	0x86	0x03 ~ 0x22	Data0	Data1	Data2	Data3	Data4	Data5	... ...	Data30	Data31	Rssi[2] 注3		CRC

The read command can read such data from Lower layer queue.

Lower layer RAM buffer that will maintain 32 payloads for one each communication.

Manually Mode:

PC-> MCU meaning, Arduino to LoRa module

Arduino sent these command sequence as:

0xC1	0x06	0x00	Data31

The Arduino program as same as Manually mode.

```
byte*  iFrogLabLoRaLibrary::Read16bytesBroadcast(){
  m_Debug=1;
  ReadMode();
  ReadClear();
```

```
//byte t2[16+1+3];

byte CRC = 0;

byte readLen=0;

// byte len=sizeof(iData) / sizeof(byte);  // sizeof(iData); //(byte)(iStr.length());

//byte len1=len+1;

//if(len==0) return;

// 定義碼-Read command

byte t1[] = {0xc1,0x06,0x00,CRC};

CRC=Fun_CRC(t1,3);

t1[3] = CRC;
```

<Application note - End>

<<iFroglab Lab Store information >>

1.LoRa gateway dongle

http://www.ifroglab.com/en/?p=6536

2.LoRa Node.

http://www.ifroglab.com/en/?p=6546

3.LoRa module Lite version.

http://www.ifroglab.com/en/?p=6501

you can purchase on Amazon or iForglab website.

/Amazon/

https://www.amazon.com/iFrogLab-gateway ... s=ifroglab

/iFroglab official store/

http://www.ifroglab.com/en/?product=ifroglab-lora-usb

Open source of iForglab

https://github.com/iFrogLab

LoRa free Docker Container

https://hub.docker.com/r/ifroglab/loragateway/

Video demonstration

https://youtu.be/jeitcZtlkqU

The Contact windows: support@looptek.com

Document History

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Document Number: LoRa-001

Revision	Orig. of Change	Submission Date	Description of Change
A	ChenYU	07/04/2018	Initial for first version.